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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/654,501	09/01/2000	Yuji Takahashi	PM 273792	7004

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EXAMINER

BAUMEISTER, BRADLEY W

ART UNIT	PAPER NUMBER
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2815

DATE MAILED: 02/10/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.
09/654,501

Applicant(s)
Takahashi et al.

Examiner
B. William Baumeister

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on Jan 15, 2003
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-22, 25-34, and 38-40 is/are pending in the application.
- 4a) Of the above, claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-22, 25-34, and 38-40 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
*See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s). _____ 6) ☐ Other:

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DETAILED ACTION

Specification

1. The disclosure is objected to because of the following informalities: Applicants have previously amended the specification to correct mistakes relating to the particular color of light that various phosphors emit (see amendment B, paper #10, entered 8/8/2002). This includes an amendment to a paragraph on page 14 of the specification wherein Applicants now states that YVO₄:Ce emits green light (fifth line of paragraph) and that YVO₄:Ce emits red light (last line).

Appropriate correction is required.

Claim Objections

2. Claim 22 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 22 has been amended to recite that the first fluorescent material (stated in parent claim 21 as emitting *green* light) comprises at least one of a Markush group that includes ZnS:Mn (third Markush element) and Y₂O₂S:Eu (fifth Markush element). As was previously explained, the Phosphor Handbook (relevant pages previously made of record) teaches that ZnS:Mn emits *orange* light (page 252) and that Y₂O₂S:Eu emits *red* light (page 190). Accordingly, the further recitation of orange and red phosphors in claim 22 broadens--as opposed to limits--the subject matter of claim 21.

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Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 12-20 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 12 recites the limitation "said fluorescent material" in line 6. As independent claim 11 has been amended to recite both "a first fluorescent material" and "a second fluorescent material," there is insufficient antecedent basis for this limitation in claim 12, rendering it unclear whether "said fluorescent material" refers to the first fluorescent material of claim 11, the second fluorescent material, or both materials.

5. Claim 22 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 22 has been amended to recite that the first fluorescent material (stated in parent claim 21 as emitting *green* light) comprises at least one of a Markush group that includes ZnS:Mn (third Markush element) and Y₂O₂S:Eu (fifth Markush element). As was previously explained, the Phosphor Handbook (relevant pages previously made of record) teaches that ZnS:Mn emits *orange* light (page 252) and that Y₂O₂S:Eu emits *red* light (page 190). Accordingly, it is unclear whether, claim 22 is limited to green-emitting phosphors rendering the objective metes and bounds of the claim indefinite.

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Claim Rejections - 35 USC § 103

6. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

7. Claims 1-3, 8, 10, 21, 26, 27, 32, 34, 38 and 40 are rejected under 35 U.S.C. 103(a) as obvious over Soules '254 in view of JP '141.

a. Soules discloses LEDs or laser diodes that emit primary, blue light in the range of 420-470 nm (col. 3, lines 57-60). The LED is covered with a phosphor-containing polymer layer 15 and clear polymer lens 16 (e.g., FIG. 2), and both of these materials may be composed of the same material such as silicone (col. 3, lines 50-56). Various phosphors are employed so that a portion of the blue light emitted from the semiconductor device is absorbed and the phosphors emit secondary, green and red light respectively, so that the primary and secondary colors are blended to produce various colors including white light.

b. Regarding claims 8 and 32, since polymer layer 15 contains the phosphors and polymer layer 16 is composed of the same material as layer 15, but does not possess phosphors, the structure reads on a polymer layer having a step-graded phosphor profile.

c. Claims 1 and 21 have been amended to set forth that the primary light source includes a GaN LED and includes a single reflector closer to the substrate than is the light

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emitting layer.¹ Newly added dependent claims 38-40 further set forth that the GaN emitter is formed on a sapphire substrate. Soules does not disclose the specific structural composition of the LED/LD that may be used nor the substrate on which the GaN emitter may be formed.

d. JP '141 (filed by Toyoda, the present assignee, and published more than a year prior to the filing of the present US application) discloses GaN emitters that employs a layer 2 of Ti (one of the materials cited as a potential reflector in the present specification at page 24, line 8) between the sapphire substrate 1 and the light emission layer 5. JP '141 states that the Ti layer functions as a reflector for reflecting light that is directed towards the substrate back towards the front, upper light emission surface (paragraph [0020]; JPO machine translation enclosed).

e. It would have been obvious to one of ordinary skill in the art at the time of the invention to have formed the GaN emitter of Soules on a sapphire substrate because this is the most conventionally employed substrate for growing GaN structures, as acknowledged by JP '141

¹During the interview with Applicant's representative 1/22/2003, Applicant's representative indicated that the amendment to the independent claims, now setting forth a single reflection layer, overcomes the cited prior-art DBR structure because a DBR is multi-layer reflection structure. The Examiner notes that the independent claims could be interpreted as still reading on an LED with a DBR, notwithstanding the change to the claim language because the claims employ the open-ended transition word "comprising," thus allowing the device to possess more than the one recited reflection layer. However, while the claim limitation does, in fact, read on a DBR, for customer service and compact prosecution, the examiner has examined the claims according to the more narrow interpretation, requiring that the LED have only a single reflection layer.

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(paragraph [0002]). It would have further been obvious to one of ordinary skill in the art at the time of the invention to have interposed a reflector between the substrate and the light emission layer of the Soules light emitter for the purpose of increasing light extraction from the front surface as taught by JP '141.

8. Claims 4-7, 9, 22 (insofar as definite) and 28-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Soules-JP '141 as applied to the claims above, and further in view of Butterworth et al. '507.

a. Soules discloses the elements as set forth above, and it also discloses that the phosphor layer 15 is covered with a bullet-shaped sealing member 16 which are both composed of the same material, as set forth in various claims such as 5-7 and 9, but does not appear to mention the presence of conventional structures such as a lead frame having a cup-shaped portion.

b. Butterworth discloses UV/blue LEDs disposed in a cup-shaped reflector/lead frame and which are overcoated with any of various bullet-shaped, fluorescent-dye-containing epoxies 240. One phosphor listed is the green-emitting ZnS:Cu,Al,Au (col. 3, line 54). Butterworth also states that depending on the implementation, some unabsorbed original blue light may also pass through the lens (col. 2, lines 64, 65) and states that multiple dyes can be employed to produce white light (i.e., also use a red dye) (col. 3, line 5). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to dispose the device taught by Soules-JP '141 on a cup-shaped portion of a lead frame as taught by Butterworth for

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the purpose of providing a receptacle for supporting the chip and the polymer and/or for increasing the light emission efficiency by reflecting laterally-directed light upward.

9. Insofar as definite, claims 11-13, 18, 20 and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Soules-JP '141 as applied to the claims above, and further in view of Hampden-Smith et al. '123. Soules discloses various phosphors that may be used for green and red photoluminescence, but does not appear to disclose any of the specific phosphors recited in the Markush group of claim 11 (ZnS:Eu and Y₂O₂S:Ce).

a. Hampden-Smith '123 teaches various sulfur-containing phosphors that can be used in an array of applications including photoluminescence (col. 35, lines 28-33). These phosphors include ZnS:Eu (paragraph spanning cols. 35-36); ZnS:Cu (Table 1, col. 37) and ZnS:Cu, Au, Al (col. 36, lines 8-15) for various hues of blue/green and CaS:Eu for red light (col. 36, line 19). It would have been obvious to one of ordinary skill in the art at the time of the invention to employ within the light emitter of Soules-JP '141, any of the phosphors specifically mentioned in Hampden-Smith for any of various reasons such as: (1) to obtain the particular hue associated with the specific phosphor or (2) for business reasons such as relating to the cost and availability of a particular phosphor.

10. Claims 14-17 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Soules--JP '141--Hampden-Smith as applied to claims 11-13, 18, 20 and 39 above, and further in

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view of Butterworth et al. '507 as applied to the claims above. As was explained previously hereinabove, regardless of whether any of the base references mentions the presence of a lead frame having a cup-shaped portion, Butterworth discloses UV/blue LEDs disposed in a cup-shaped reflector/lead frame and which are overcoated with any of various bullet-shaped, fluorescent-dye-containing epoxies 240. Butterworth also states that depending on the implementation, some unabsorbed original blue light may also pass through the lens (col. 2, lines 64, 65) and states that multiple dyes can be employed to produce white light (i.e., also use a red dye) (col. 3, line 5). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to dispose the device taught by Soules--JP '141--Hampden-Smith on a cup-shaped portion of a lead frame as taught by Butterworth for the purpose of providing a receptacle for supporting the chip and the polymer and/or for increasing the light emission efficiency by reflecting laterally-directed light upward.

Response to Arguments

11. Applicant's arguments with respect to the claims have been considered but are moot in view of the new ground(s) of rejection.

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Conclusion

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

a. Chiyo et al. '217 claims foreign priority to the cited JP '141 and serves as at least a partial translation of JP '141.

INFORMATION ON HOW TO CONTACT THE USPTO

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to the examiner, **B. William Baumeister**, at (703) 306-9165. The examiner can normally be reached Monday through Friday, 8:30 a.m. to 5:00 p.m. If the Examiner is not available, the Examiner's supervisor, Mr. Eddie Lee, can be reached at (703) 308-1690. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0956.



B. William Baumeister

Patent Examiner, Art Unit 2815

February 5, 2003